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ABSTRACT

This report considers ways in which schools should introduce new educational technologies, particularly microcomputers, into the classroom without "overselling" the value and usefulness of such technology. Resistance by the public and by teachers to previous educational innovations is examined, as are current barriers to the adoption of new educational technologies. Warning against a "quick technological fix," the report presents 22 recommendations for promoting the successful adoption of new educational technologies which are concerned with the role of teachers, the role of administrators, funding, training, and curriculum development. A 28-item bibliography is provided. (EW)

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THE SUCCESSFUL INTRODUCTION OF NEW EDUCATIONAL TECHNOLOGIES: BREAKING THE CYCLE OF CIRCUS OVERSELL

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THE SUCCESSFUL INTRODUCTION OF NEW EDUCATIONAL TECHNOLOGIES: BREAKING THE CYCLE OF CIRCUS OVERSELL

The Circus Side Show

Advocates of new educational technologies are often guilty of overselling the value and usefulness of the innovations they promote. Like the exaggerated claims of a barker at a circus side show, the prophecies of these advocates initially heighten the public's expectations but ultimately lead to disappointment. The prophecies are proven false, and the technology is reduced to a role of marginal influence on education. Thus, "token saturation" has often been the end result in the past, with mechanical devices being underutilized and separated out from the mainstream of educational experience despite the fairly wide availability of these devices (Janowitz and Street, 1966, pp.224-25). This scenario describes the adoption attempts made on behalf of radio in the 1920's, films in the 1930's, television in the 1950's, teaching machines in the 1960's, and dial-access technology and language laboratories in the 1970's (Sharkan and Goodman, 1982, p.13). Unless educators learn from the mistakes of the past, computers may face a similar fate in the 1980's.

Some overly enthusiastic predictions about computers have already surfaced. For example, it was falsely predicted that "ten million home computers would be in American homes

by 1980" (Gerardi et al., 1981-82, p.357). Prophecies originating in the 1960's about the widespread educational use of Computer Assisted Instruction (CAI) by 1980 also failed to materialize (Chambers and Sprecher, 1983, p.116). Obviously, the promoters of any new educational technology need to proceed more cautiously, avoiding the temptation to engage in circus oversell.

In short, educators must come to understand the limitations of technology. As noted by Sharkan and Goodman (1982), "(t)echnology may revolutionize education only on the premise that it will enable us to do a better job of teaching" (p.13). By summarizing historical lessons on educational change, exposing present barriers to the adoption of educational technologies, and applying the findings of recent studies on school usage of microcomputers and television, this paper seeks to formulate recommendations and an accompanying rationale for how schools should introduce a promising new technology and/or its products.

Lessons on Educational Change

According to Mort (1964, p.318), changes in American public education come about through a slow and somewhat predictable process. Generally, it takes a half-century for an educational need to be identified and for a way to meet this need to be introduced. The diffusion of the innovation may take another half-century, divisible into a

fifteen year period of independent innovation, a twenty year period of rapid diffusion, and a long period of slow diffusion.

The American school system's resistance to change is evident in the limited number of success stories in terms of technological innovations that have been widely adopted in the schools. Parelius and Parelius (1978, pp.92-95) describe three such innovations, including paperback books, instructional television, and new curricula in physics and mathematics. Of the subjects of these three "success stories," only paperback books have achieved a well-established position in traditional teaching through wide diffusion and usage.

The "paperback revolution" occurred because of technological advances in printing, reproducing, and binding that cut costs significantly. As a result, access to diverse and specialized printed information has increased, and teachers are now able to be more discriminating in their selection of materials appropriate for specific courses. Perhaps the success of this technology can best be attributed to the fact that no radical change in school and classroom organization is necessitated (Janowitz and Street, 1966; Parelius and Parelius, 1978, p.92).

The success of instructional television is less well established, for predictions that all homes would soon have access to the classrooms of master teachers served to over-

sell the technology. Nevertheless, the innovation has resulted in greater adult access to higher education and in the development of innovative children's programs by various organizations. Sesame Street, a program produced by the Children's Television Workshop and aimed at improving the reading skills of young children, has been evaluated extensively. Its effectiveness has been both praised and questioned, and various controversies, such as charges of sexual stereotyping and inappropriate teaching methods, have surrounded the series. Despite these problems, the series has been quite successful and is viewed by a large audience (Blanton, 1972, pp.804-05; Parelius and Parelius, 1978, pp.92-94).

Curriculum reform efforts, begun in the late 1950's and centered around physics and mathematics, also met with limited success. For the physics curriculum, new sets of materials, texts, films, and laboratory equipment were developed. Sample textbooks for grades 7-12 were develped in order to upgrade the mathematics curriculum. However, the new courses were not used as frequently as their scholarly authors had envisioned and impact on classroom practice was small (Conant, 1967, pp.54-55; Parelius and Parelius, 1978, pp.94-95; Silberman, 1971, pp.171-72; Spring, 1976, pp.113-27).

Kelman et al. (1983, pp.140-42) suggest that the developers and advocates of the new math made several crucial

errors that doomed their efforts to certain failure. First, these proponents engaged in a "top-down" reform movement involving university scholars and an elite group of secondary teachers. From planning to implementation stages, the curriculum reform effort never became a grass-roots movement. Secondly, the new math was a total departure from the ideas, concepts, and methods familiar to parents, students, and most teachers. Thirdly, the innovations placed numerous demands on the teachers, requiring them to learn new content and methods and to utilize new materials. Unfortunately, teachers were often pressured to take various workshops in order to keep up with the changing mathematics curriculum. Fourthly, reform excesses led to mockery in the press. Fifthly, the new math ran contrary to the conservative push for basic education. Lastly, proponents largely ignored other societal changes influencing mathematics and education in general.

If computers are to significantly impact the processes and content of education, proponents of this technology must learn from the mistakes of the past. Several points favor the success of an educational computing revolution. The nurturing support of computer enthusiasts, including parents, teachers, and students, makes educational computing a largely grass-roots movement. Also, educational computing is up-to-date and in step with major sociopolitical developments. Other points about educational computing do not favor its success. The changes required are quite demanding of teachers

in terms of new content and methods to be learned; thus, teacher training in the use of the new technology is a must. The possibility of a radical break with traditional educational practices may be threatening to many parents and teachers. Furthermore, novel uses of computers and uninspired uses of computers (such as drill and practice) are ideal topics for criticism in the public press (Kelman et al., 1983, p.141).

Perhaps Edward Spencer, an anthropologist, provides the best summary of lessons concerning the introduction of technologies and the fate of educational change. Wolcott (1981, p.25) outlines Spencer's six propositions which those who develop and promote technologies must heed if they are to avoid failure. First, people tend to resist changes that seem to threaten their basic securities. Secondly, people resist what they do not understand. Thirdly, forced changes tend to be opposed. Fourthly, people do not abandon the status quo unless some felt need cannot be satisfied within the prevailing system or state of affairs. Fifthly, the way the new technology is administered, not the technology itself, may be the focus of resistance. In this case, the innovative technology becomes a symbol of peoples's opposition to the innovators. Lastly, the technology must be "made intelligible and given value" in terms of the recipient's subculture (the school and classroom), rather than the donor's subculture (science and technology). Wolcott con-

cludes that teachers ultimately determine the success or failure of adoption efforts. He suggests that developers and promoters of educational technologies should direct their efforts at identifying the concerns of "help-seeking teachers." For example, he notes that proponents of instructional television could benefit their cause by appealing to the "shortage concerns" of teachers. Teachers with shortage concerns include those who are or who perceive themselves to be short on subject area content, especially concepts. Another typical shortage concern involves an insufficient supply of available energy because of the energy-drain of classroom teaching (Wolcott, 1981, pp.24, 27).

Present Barriers to the Adoption of Educational Technologies

The barriers standing in the way of successful adoption of new technologies are well known. Educators such as Forman (1983), Rose (1982), and Duttweiler (1983) have exposed these obstacles and subjected them to close scrutiny.

In reviewing reports by Chambers and Bork, Forman (1983, p.135) identifies five major impediments to the introduction and adoption of computers in education. First, insufficient funding hinders the purchase of hardware and courseware. Secondly, educators lack knowledge about how to effectively make use of computers in the classroom. Thirdly, negative attitudes on the part of faculty impede

progress. All too often teachers perceive the computer as being too difficult for them to learn how to use and as being threatening to their job security. Fourthly, the lack of quality courseware that can run on more than one system constitutes a formidable obstacle. Lastly, the diversity of computer hardware systems and languages tends to be confusing.

Rose (1982, pp.12-14) describes four barriers to the use of educational technologies. These barriers include institutional economic barriers, technological barriers, administrative/institutional barriers, and individual educator barriers.

In terms of institutional economic barriers, funding may not be available for the purchase and maintenance of necessary equipment. Administrators and others may not be willing to adopt an innovative technology that requires an ongoing commitment of resources. In addition, an urgent need for change may not be felt (Rose, 1982, p.12).

In terms of technological barriers, educators may resist change for numerous reasons. The very nature of the technology itself may force teachers to alter their teaching patterns, making them feel incompetent if they do not have the skills required for the use of the new technology. Teachers may also come to feel overdependent on the technology, with no control over its success or failure. A technology is often viewed as just another tool or method

instead of an integrated instructional alternative. Some teachers may even consider the technology to be too much trouble, especially if they fail to perceive the usefulness of the technology. Furthermore, additional problems may be posed by the availability, accessibility, and scheduling of equipment (Rose, 1982, pp.12-13).

Administrative/institutional barriers include the overselling of alternative educational technologies by administrators and communications specialists, the forced teacher-use of costly systems by administrators, the failure of administrators to support and reward innovative users of an instructional technology, the absence of detailed planning for the use of educational technologies, and the lack of evaluation of the effects of using educational technologies. Often, the role of specialists in educational communications is ill defined, and administrators fail to fulfill their leadership role by not pointing out to teachers the advantages of educational technologies and by not supporting experimentation and providing mechanisms for more rapid diffusion (Rose, 1982, p.13).

Internal factors associated with individual educators may best explain the reluctance of educators to adopt non-traditional technologies. Teachers may lack an understanding of the technology, may perceive it as a threat to their jobs or traditional roles, may not be willing to make the time commitment required to develop quality programs, and

may become disillusioned when their expectations of support from educational communications specialists are not met. Perhaps the most important factor influencing teacher attitudes is the fact that teachers regard teaching as a "solo activity" which requires them to closely direct students in all learning activities (Rose, 1982, pp.13-14).

Duttweiler (1983) proposes the existence of three barriers to the optimum use of educational technology. The first two barriers, the state of the art and the lack of knowledge and skills, are similar to those described by Forman (1983) and Rose (1982). The lack of quality computer software exemplifies the state of the art barrier. Product development tools and techniques that are applicable to textbooks need to be exchanged for new methodologies that are applicable to interactive and multimedia instruction. Lack of computer knowledge and skills illustrates the second barrier. Teacher training that emphasizes group rather than individualized content delivery and content rather than problem solving skills may be inappropriate for preparing teachers to use an educational innovation such as the computer. Duttweiler sees these first two barriers as the easiest to overcome, and offers the following scenario of how the elimination of these barriers will come about in the near future:

> The state of the art is constantly changing and, as the demand for software grows, existing software developers will turn out more sophisticated educational products; and publishing companies that are now almost ex-

> clusively engaged in the printing of textbooks will enter the software market. Educational researchers will develop new methods appropriate to multimedia instruction, and teachers will learn to integrate the various technologies into their courses.

On the other hand, Duttweiler's explication of the third barrier, the present governing structure, contains some unique ideas not covered by Forman (1983) or Rose (1982). The resolution of the problems inherent in this barrier is also more problematic. According to Duttweiler, optimum use of educational technology can only occur after adaptations of curricula, schedules, and classroom organization have been made. He favors the elimination of various legal barriers, including the following aspects of the present governing structure of schools: student/professional staff ratio requirements; state mandated grade organization; attendance requirements; state determined curricula; library regulations that neglect acquisition of computer software; limits on the number of graduation units that one can earn in a year and through individual study; and the defining of classes, courses, and graduation units in terms of the amount of time that is spent instead of the amount of learning that occurs. The difficulty in surmounting the third barrier is quite evident. Obviously, teachers are going to oppose any move that might lead to decreases in the number of professionally certified teachers. In addition, regulations that were originally designed to ensure students an

adequate education will not be easily removed from the books (Duttweiler, 1983, pp.37-39).

It is the opinion of this writer that some of Duttweiler's views go a bit too far. Over-emphasis on the cost-effective use of professional staff, for instance, serves only to feed teacher fears of being replaced by machines and supervising paraprofessionals. On the other hand, his notion that accomplishment should be the major criterion for school placement and promotion makes a great deal of sense.

The Quick Technological Fix

Some educators warn that U.S. public schools may not survive unless they meet the demands for a technologically relevant curriculum in the near future. For example, Pogrow (1982, p.611) suggests the possibility of impending "environmental collapse," a phenomenon that occurs when dissatisfied clients decide not to try to change an organization but to abandon it in favor of a more economically attractive alternative that is based upon a new technology. Because of the socialization and custodial functions of schools, the demise of U.S. public schools does not seem imminent. Furthermore, the salvation of American education is not likely to come from any "quick technological fix." The structure of the American school system is ideally designed to resist change, and new educational hardware is often found to be wanting (Oettinger, 1969). In light of these

facts, Oettinger (1969) suggests that educational technology needs "better ideas, better people, and more money" (p.221). He goes on to argue for the benefits of competition in education, calling for a system featuring "some elements of market competition, with careful checks and controls built in" (p.225). While agreeing with Oettinger's basic assessment of the relationship between education and technology, this writer offers a markedly different set of recommendations for promoting the effective and more rapid introduction of technology into the public schools.

Recommendations For Promoting the Successful Adoption of New Educational Technologies

Based on the preceding literature review and on the findings of recent studies on school usage of microcomputers and television that are noted below, this writer advances the following recommendations and accompanying rationale for how schools should introduce a promising new technology and/or its products:

1. A group of teachers, not a single teacher, should help initiate and organize the use of the technology. In a study of school uses of microcomputers, the Center for Social Organization of Schools (1984, p.4) found that schools that followed this recommendation demonstrated the most successful use of the technology (use for more hours a week; greater use by below-average, average, and above-average students; greater use across a variety of applications; a higher

proportion of a school's students using the technology per week).

2. Administrators (especially principals) should participate with the group of teachers in initiating and organizing the use of new technologies. In a study of school uses of microcomputers, the Center for Social Organization of Schools (1984, pp.5-6) found that schools that followed this recommendation provided for more of a parity between the use of the technology made by above-average and below-average students. These schools also had more of a balance between types of uses (programming vs. drill and practice).

3. Administrators (especially principals) and assisting teachers should initiate the idea of obtaining the technology, should make the decisions about what and how much to acquire, should make the decisions about efforts to obtain funds, and should be involved in the implementation effort. In a study of school uses of microcomputers, the Center for Social Organization of Schools (1984, pp. 9-12) found that schools that followed this recommendation achieved a variety of positive student outcomes (student enthusiasm for school; mutual assistance among students; students working independently; more individualized learning tasks; learning by below-average, average, and above-average students).

4. Schools should use the solo teacher or teacher buff in the implementation stage. These teachers, because

of their knowledge and enthusiasm, can play an important role in training teachers. In a leadership role, these enthusiasts can inspire others and promote schoolwide use of the technology (Sheingold et al., 1983, p.427).

5. The role of teacher buff should be institutionalized and clearly defined. One person at the district level and counterparts at the building level should be chosen. This recommendation helps ensure the availability of expert assistance when needed by individual classroom teachers. Approximately one half of all schools utilizing instructional television have designated such personnel (Dirr and Pedone, 1979, p.6).

6. When possible, grant money, district funds, and/or local fund-raising (PTA) contributions should be used rather than school, principal, or departmental funds. In a study of school uses of microcomputers, the Center for Social Organization of Schools (1984, pp.7-9) found that schools that followed this recommendation had a lower (better) ratio of students per unit of equipment, a broader base of students with access to the technology (greater proportion of students using the technology; parity of use by below-average, average, and above-average students), and average to greater than average equipment use.

7. Avoid over-dependence on a local initiative model of innovation. Over-dependence on local initiative could result in differential access and unequal distribution among

schools (Sheingold et al., 1983, pp.426-27). Use of district funds and grant money could help in this respect. The administrator-teacher participation mentioned above could take place at the district level, with representatives drawn from each school.

8. If money is lacking for the new technology and if faculty (teachers and administrators) want to use the technology, alternative funding sources should be sought. At least this kind of effort demonstrates a positive attitude toward innovation (Rose, 1982, p.14). Lower middle income schools and minority and rural elementary schools should take advantage of grant money in funding acquisition of a new technology. These schools appear to have the best chance of taking advantage of grant sources for this purpose. Also, the grants seem to have some equalizing effect between wealthier and poorer schools (Center for Social Organization of Schools, 1984, pp.6-7).

9. When possible, equipment should be placed in the classroom to aid the spread of the innovation to other teachers besides the known teacher enthusiasts and to aid the integration of the new technology into the classroom curriculum. Sheingold et al. (1983, p.427) found that teachers in a district where microcomputers were placed in classrooms sought to inspire other teachers, while teachers in a district where microcomputers were placed in media and resource centers did not.

10. Schools should ensure easy access to reliable, in-repair equipment (in classrooms or in library media centers, for example). In addition, teachers should be able to obtain instructional materials (such as computer software) from a central source within the school (a library media center, for example) rather than from a central source within the district. The easier it is for teachers to gain access to a technology and its products, the more likely teachers are to use the technology and its products. As a case in point, easy access to reliable equipment is a facilitating factor in school use of instructional television (Dirr and Pedone, 1979, p.5). In terms of computers in education, Stevens (1980, p.231) concludes that having "reasonable access to adequate computer facilities" is a necessary condition for attaining optimum results.

11. Preservice and inservice training in the use of the technology should be provided in order to decrease the variability in teacher knowledge of or interest in the innovation. Classes or workshops that feature hands-on experience with the technology can make teachers feel confident and comfortable, and knowing how to deal with any possible malfunctions can give teachers a sense of control. Thus, positive teacher attitudes toward the technology can be promoted through teacher training (Rose, 1982, pp.14-15; Stevens, 1980, pp.230-31).

Classes and workshops can also help reduce teacher

fears by giving them the technological skills they lack and by assuring them that the technology is not a replacement for teachers. Teachers will never be superseded by machines, for there is a limit to the amount of time that students can profitably spend working with such devices. Also, certain human factors are irreplaceable (Gerardi et al., 1981-82, p.359; Sharkan and Goodman, 1982, p.13; Rose, 1982, p.15).

12. Administrators should not coerce teachers into using new technologies. They should convince teachers to undertake the effort needed for technological innovation in education by providing teachers with the latest research evidence regarding appropriate educational uses of the technology. Information on the advantages, disadvantages, and limitations of the technology should also be provided. If this information is not made available, some teachers are likely to remain hesitant (Rose, 1982, pp.14-15; Stevens, 1980, pp.230-31).

13. Teacher training sessions should stress academic and curricular needs, thereby providing the impetus for introducing new instructional technologies. Through such sessions, detailed plans can be developed whereby the use of the technology as an integral part of the teaching-learning process is specified (Rose, 1982, p.15).

14. Teacher educators should acquire the skills and competencies related to instructional applications of technology in order to adequately train future teachers (Diem,

1984, p.15; Stevens, 1980, p.231). Sprecher and Chambers (1983, p.117) state that teacher educators should be given release time to conduct research on the use of CAI materials to facilitate learning. Based on this research, teacher education courses should be developed and introduced that provide future teachers with a minimal background in implementing the technology.

15. Principals and superintendents should also be trained in the use of the technology. As noted above, teacher training in the use of a technology can have a positive impact on teacher attitudes and on teacher usage of a technology. In a study of school utilization of instructional television, Dirr and Pedone (1979, p.6) found that teachers trained in ITV had slightly more positive attitudes toward ITV and used ITV more in their classrooms. Likewise, districts with a superintendent trained in ITV tended to have more television sets than districts without a superintendent trained in ITV.

16. Schools should give teachers time to use the equipment, review or develop instructional materials (such as software or courseware), and plan for classroom use of the technology (especially in terms of integrating the technology into the curriculum). Lack of time and energy is often cited by teachers as a barrier to more effective implementation (Rose, 1982, p.14; Sharkan and Goodman, 1982, p.12; Sheingold et al., 1983, pp.429-30).

17. Schools should offer formal incentives or rewards for expertise in the new technology and for development of instructional materials (such as software and courseware). Rewards to innovative users of new technologies should take the following three forms: verbal, financial, and physical--i.e. rewards of additional equipment (Rose, 1982, p.15). By following this recommendation, schools can overcome teacher resistance to change and increase teacher preparation through motivating teachers to make the necessary investment of their time and energy. In accord with this recommendation, Spuck (1981, p.17) suggests that college faculty members should be properly rewarded for their efforts in developing learning materials for new instructional technologies.

18. Certain governing structures supporting the traditional organization of education should be removed, for a new technology normally implies the need for a new organizational structure. Specifically, classes, courses, and graduation units should be defined in terms of accomplishment rather than time spent.

19. Do not expect increases in productivity or other educational benefits too quickly. Unrealistic expectations can doom technological innovation before it has a chance to demonstrate its value or worth (Spuck, 1981, p.16).

20. Evaluation processes that are consonant with instructional technologies should be developed and utilized by schools (Rose, 1982, p.15). Educational decision-makers

need information about the results of using an educational technology.

21. The materials developed or selected (such as software and courseware) should be of sufficient quality to be of lasting value. Following this recommendation helps to offset the heavy initial investment in an educational technology (Spuck, 1981, p.20). Also, inferior instructional materials can easily "turn off" teachers to the new technology. Staff development can be employed to help teachers learn how to use appropriate criteria for the evaluation and selection of instructional materials (Stevens, 1980, p.230).

22. Schools should blend course material, equipment, and faculty development. Budgetary provisions for these three domains may be disproportionate in any given year but should be proportionate across several years. Course material selection should be based on curricular needs, and equipment selection should be based on course material needs. These three domains are thus interactive and dependent on each other. Ignoring any one will undermine adoption efforts (Bowman, 1983, pp.42-43; Spuck, 1981, p.171).

The Adoption Ideal

Two major themes emerge from the detailed list of recommendations given above. First, the ideal model for adoption features a dynamic, aggressive, and literate administrator with training in the technology. The administrator needs to

be skilled in "good personnel management," which includes such things as "planning for both long- and short-term goals and including alternatives; communicating with their staff a common set of expectations; matching persons to programs; delegating tasks according to staff strengths; and establishing and maintaining control" (Evans and Elium, 1982, p.123). Secondly, in the adoption ideal, adoption efforts begin by focussing on academic and curricular needs. Typically, staff development workshops and courses are disconnected, and they tend to stress dissemination of the technology rather than what constitutes appropriate classroom practice (Evans and Elium, 1982, p.123).

In accord with the adoption ideal, Diem (1984, pp.14-15) proposes a teacher training model premised on four main ideas, including the focus on academic and curricular needs. First, no curricular area should be exempt from the responsibility of developing technological literacy. For example, ethical issues can be covered in social studies classes, and word processing can be done in language arts classes. Secondly, teacher training emphasis should be on curriculum development, which "involves understanding curriculum needs, population expectations, and intended learning outcomes" (p.14). Simply learning how to operate the new technological device is not enough, for teachers must learn how to use the new technological device as an effective instructional tool. Thirdly, teachers should

participate in selecting components for the new technology (computer hardware and software, for example), utilizing ongoing criteria as the technology changes. In the case of computers, the selection process would involve identifying the program users, program usage, hardware requirements, the quality of software, and costs. A similar process should be followed for other technologies as well. Fourthly, technological skills and objectives need to be incorporated within instructional objectives in a variety of academic disciplines.

In the adoption ideal, innovative instructional technologies are selected based on their inherent characteristics and limitations, learners' needs and interests, instructional objectives, and the controlling institution's educational philosophy (Martin, 1982, p.23). Salisbury (1984, pp.22-24) proposes a three-phase questioning process to be used when planning programs and deciding when and where to use a technology. The first phase deals with determining what student performance gaps exist. A needs assessment, resulting in a statement about the present state of learner behavior in a goal area and a statement about the desired acceptable state of learner behavior in the same goal area, serves to answer the first question. The second phase deals with determining what "functions" need to be performed in order to close the gap between observed and acceptable student performance. Instructional design lit-

erature and models such as *Gagne's Events of Instruction* may prove helpful in identifying needed functions in this phase. The third phase deals with determining what alternatives are available to perform the needed functions identified in the preceding phase. Various media selection models are potential sources of information. In this final phase, constraints such as time, money, and human resources are taken into consideration. Salisbury's questioning process conforms to the adoption ideal and is obviously superior to a process that starts with the hardware and works backwards.

Breaking the Cycle of Circus Oversell

In an age of high technology, schools are wise in responding to innovations with skepticism. The value of many past innovations, such as programmed instruction and teaching machines, is questionable. Innovation is not necessarily equated with improvement; thus, the barriers to adoption of new instructional technologies may serve a useful purpose in education. The educational community needs to guard against adopting technologies simply because of the amount of publicity they have received, for such adoption decisions are more prudently based on educational value (Parelius and Parelius, 1978, pp.98-99). In shaping the future direction and nature of American public schools, decision-makers in education must engage in astute opportunity management whereby they come to "understand the alternatives

before them and the likely consequences of various possible actions" (Burnham, 1981, p.8). By following the recommendations and the ideal model of adoption given above, schools should be able to accomplish the successful introduction and adoption of new technologies with educational value. They should also be able to answer the who, what, where, how, when, and why questions about education in the future. The cycle of circus oversell will finally be broken.

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